

ENVIRONMENTAL ASSESSMENT

Tiger Muskie Stocking in Yellow Water and Big Casino Creek Reservoirs



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Chapter 1.0: Purpose of and Need for Action

1.1 Proposed Action

Montana Fish, Wildlife and Parks (FWP and/or Department) proposes to stock tiger muskie in Yellow Water and Big Casino Creek Reservoirs.

1.2 Need for the Action

The recreational fisheries at the proposed waters are currently poor quality. The productivity of the fisheries are limited by the abundance of undesirable fish species (i.e. white sucker and common carp) and the resulting competition for resources with more desirable game fish species.

1.3 Objectives of the Action

The objectives of the Proposed Action would be to:

1. Improve the recreational fisheries at the proposed waterbodies, thereby increasing angler satisfaction.
2. Reduce the abundance of undesirable fish species at the proposed waterbodies.
3. Provide a unique, trophy fish opportunity at the proposed waterbodies.

1.4 Relevant Authorities

Montana Fish, Wildlife and Parks has the authority under state law (§ 87-1-301 Montana Code Annotated (MCA)) to "set the policies for the...propagation of the...fish...of the state for the fulfillment of all other responsibilities of the department related to fish and wildlife as provided by law."

Furthermore, it is the policy of Montana FWP, under Administrative Rules of Montana (ARM) 12.7.601(4), that "Introduction of fish not indigenous to a particular drainage may be made only after careful study to ensure these fish will be beneficial to that area." This EA is intended to document careful study of the proposed fish introduction.

1.5 Relevant Plans

The 2019-2027 draft *Statewide Fisheries Management Program and Guide* (currently in

public review) does not specifically address management plans at Yellow Water Reservoir. Yellow Water Reservoir falls under the general reservoir plans, which states the management direction should focus on maintaining stocking rates and manage for recreational fisheries with consumptive harvest. The plan does specifically mention Big Casino Creek Reservoir, with the management direction stating focus should be placed on developing recreational fisheries for largemouth bass and black crappie and taking efforts to control yellow perch numbers.

The proposed action is intended to improve the recreational fisheries at the proposed waters, in accordance to relevant plans as stated in the *Statewide Fisheries Management Program and Guide*.

1.6 Decision to be Made

The decision to be made is whether FWP should move forward with the proposed alternative of stocking tiger muskie in Yellow Water and Big Casino Creek Reservoirs. Following completion of the Environmental Assessment (EA) and public comment period, the FWP Region 4 Fisheries Manager will issue a decision notice recommending a course of action. This course of action could be the Proposed Alternative, the No Action Alternative, the Mechanical Suppression Alternative, the Piscicide Treatment Alternative, or an action that is within the scope of the analyzed alternatives. This EA and the public comments FWP receives are part of the decision-making process.

Chapter 2.0: Alternatives Including the Proposed Action

2.1 Alternative A: Proposed Action: Stock Tiger Muskie in Yellow Water and Big Casino Creek Reservoirs

The Stock Tiger Muskie alternative would result in tiger muskie being stocked in Yellow Water and Big Casino Creek Reservoirs (maps located in Appendix A) to act as biocontrol of nongame species (i.e. white sucker and common carp). The practice of stocking tiger muskie, a sterile hybrid of northern pike and muskellunge, as biocontrol has been increasingly common throughout the west. Tiger muskie are voracious predators and can convert undesirable biomass into a recreationally valuable fishery. Stocking tiger muskie is not a silver bullet. Tiger muskie have been documented to prey upon numerous species and their diet can be dependent on the prey available. Additionally, tiger muskie will only act as suppression of nongame fish. Complete removal is not an expected result of stocking tiger muskie. With appropriate stocking densities, tiger muskie have been documented to effectively act as biocontrol while

maintaining recreational fisheries. Stocking densities would be partially dependent upon the size of fish stocked, but would most likely be 2-5 fish per surface acre, with a target tiger muskie abundance of 1-2 fish >36" per surface acre after 4 years.

2.2 Alternative B: No Action

The No Action alternative would result in no fisheries management action being taken and the status quo would continue at each water. The fishery at Yellow Water Reservoir would continue to be dominated by common carp and white suckers, to the detriment of the recreational trout fishery. Improvements in the rainbow trout fishery would be dependent on environmental conditions to induce a drought cycle that would reduce water storage to the point of eliminating the entire fishery. FWP assumes that the recent illegal introduction attempts of yellow perch and walleye in Yellow Water are associated with disgruntled anglers stemming from the current lack of a recreational fishery. The No Action Alternative would result in no change to the fishery and illegal introductions may continue. The fishery at Big Casino Creek Reservoir would continue to be limited due to white sucker abundance. FWP's management objective at Big Casino is to provide a diverse angling experience close to Lewistown, based on public input expressing such desires. The No Action Alternative would not benefit the objective fishery of largemouth bass and crappie, nor would it introduce a unique species for anglers to target close to Lewistown. The No Action Alternative would save money and time required to stock and monitor the proposed stocking of tiger muskie. The No Action Alternative would eliminate the risk of unintended consequences, such as predation of non-target species and escapement to downstream waters.

2.3 Alternative C: Mechanical Suppression

Mechanical suppression would involve high-intensity, long duration trap netting of the reservoirs. Mechanical suppression efforts require many person-hours of work and training, large amounts of travel, interruption of anglers, and a large time commitment of agency staff. Additionally, any benefits are usually short-term without continued annual suppression efforts. The Mechanical Suppression alternative would potentially improve the recreational fisheries by manually removing suckers from the systems. A positive of this approach is that there are no risks stemming from biological manipulation. There are numerous downsides to this alternative, including time, cost, labor, and the fact that any improvements are short-term in nature. The effectiveness of mechanical suppression on Yellow Water would be limited, given the size of the reservoir. The effectiveness of mechanical suppression on Big Casino would be limited given the continual source of white suckers from the drainage upstream.

2.4 Alternative D: Piscicide Treatment

For the Piscicide Treatment Alternative, a piscicide (rotenone) would be used to euthanize all fish in the reservoir. Chemical removal efforts can be very effective and would allow FWP to start with a blank slate at each reservoir. Unfortunately, there are significant limiting factors to the feasibility and effectiveness of the Piscicide Alternative at each reservoir. At Yellow Water Reservoir, the potential cost of a piscicide treatment would make it unfeasible. The approximate cost of the piscicide alone would be \$100,000 if the reservoir was treated at full pool and about \$40,000 if the treatment occurred at slightly less than half pool (1500 AF). The cost/benefit of a piscicide treatment at Yellow Water would be difficult to justify at those levels given the relatively low level of use it receives. The Piscicide Alternative could become feasible at Yellow Water in the future if reservoir volume was reduced to dead storage. At Big Casino Creek Reservoir, a piscicide treatment would eliminate the fishery in the reservoir, however it would not address the continual source of white suckers from the upstream drainage. Additionally, Big Casino is a flow through reservoir and a treatment would require complete deactivation of the piscicide, adding cost and complexity to the effort. For these reasons, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

Chapter 3.0: Affected Environment & Predicted Environmental Consequences

3.1 Terrestrial Species

Both reservoirs and the surrounding areas are utilized by many terrestrial species. Of notable interest to the Proposed Action are amphibians and birds. Using information from the Montana Natural Heritage Project (available at mtnhp.org), documented amphibians include the boreal chorus frog and northern leopard frog. Boreal chorus frogs are found in water only during their breeding period in spring. Northern leopard frogs may be year-round residents of the reservoirs. Sixty-six species of birds have been documented at Yellow Water Reservoir, 34 of which are wading birds, waterfowl, or other aquatic birds. There are 15 terrestrial Montana Species of Special Concern that occur in the vicinity of Yellow Water Reservoir. One hundred twenty-two species of birds have been observed in the vicinity of Big Casino Creek Reservoir, 22 of which are wading birds, waterfowl, or other aquatic birds. There are 10 terrestrial Montana Species of Special Concern that occur in the Big Casino Creek Reservoir area.

Alternative A: Proposed Action

The proposed action of stocking tiger muskie would be expected to have minor impacts to terrestrial species, in particular amphibians and small birds. The expected impacts would be via predation. Tiger muskie are opportunistic predators and while they primarily prey upon other fish when available, portions of their diet may include freshwater crustaceans, amphibians and, to a lesser extent, small mammals (e.g. muskrat and mice) and small birds (e.g. ducklings and goslings). The Department expects minor predation impacts to the terrestrial species given the low stocking densities planned (~2-5 fish per surface acre) and the relatively small proportion of tiger muskie diet that would consist of terrestrial species. Additionally, the potentially impacted species are locally abundant and no population level impacts would be expected.

Alternative B: No Action

The No Action Alternative would be expected to result in no impacts to terrestrial species.

Alternative C: Mechanical Suppression

The Mechanical Suppression Alternative would be expected to have negligible impacts to terrestrial species. Impacts could occur via ensnaring diving birds and small mammals in the trap nets, resulting in the animals drowning. This incidental catch is rare in trap netting, but is known to occasionally occur. Trap nets could be set such that they are not fully submerged, which would reduce the associated risks. Given the rarity of such impacts, the Department would not anticipate anything but very minor impacts to terrestrial species.

Alternative D: Piscicide Treatment

As summarized in 2.4, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

FWP would anticipate minor impacts to terrestrial species, primarily larval amphibians (should they be present at the time of treatment) from the Piscicide Treatment Alternative. Most piscicide treatments are planned for late summer/autumn, thus reducing potential impacts to larval amphibians.

Birds & Mammals – Mammals are generally not affected by rotenone at fish killing concentrations because they neutralize rotenone by enzymatic action in their stomach and intestines (AFS 2002). Studies of risk for terrestrial animals found that a 22-pound dog would have to drink 7,915 gallons of treated lake water within 24 hours, or eat 660,000

pounds of rotenone-killed fish, to receive a lethal dose (CDFG 1994). The State of Washington reported that a half pound mammal would need to consume 12.5 mg of pure rotenone to receive a lethal dose (Bradbury 1986). Considering the only conceivable way an animal can consume the compound under field conditions is by drinking lake or stream water, a half-pound animal would need to drink 33 gallons of water treated at 2 ppm.

The EPA (2007) made the following conclusion for small and large mammals:

When estimating daily food intake, an intermediate-sized 350 g mammal will consume about 18.8 g of food. Using data previously cited from the common carp with a body weight of 88 grams, a small mammal would only consume 21% (18.8/88) of the total carp body mass. According to the data for common carp, total body residues of rotenone in carp amounted to 1.08 µg/g. A 350 g mammal consuming 18.8 grams represents an equivalent dose of 20.3 µg of rotenone; this value is well below the median lethal dose of rotenone ($39.5 \text{ mg/kg} \times 0.350 \text{ kg} = 13.8 \text{ mg} = 13,800 \text{ µg}$) for similarly sized mammals. When assessing a large mammal, 1000 g is considered to be a default body weight. A 1000 g mammal will consume about 34 g of food. If the animal fed exclusively on carp killed by rotenone, the equivalent dose would be $34 \text{ g} \times 1.08 \text{ µg/g}$ or 37 µg of rotenone. This value is below the estimated median lethal equivalent concentration adjusted for body weight ($30.4 \text{ mg/kg} \times 1 \text{ kg} = 30.4 \text{ mg} = 30,400 \text{ µg}$). Although fish are often collected and buried to the extent possible following a rotenone treatment, even if fish were available for consumption by mammals scavenging along the shoreline for dead or dying fish, it is unlikely that piscivorous mammals will consume enough fish to result in observable acute toxicity.

One study, in which rats were injected with rotenone for a period of weeks, reported finding lesions characteristic of Parkinson's disease (Betarbet et al. 2000). However, the results have been challenged on the basis of methodology: 1) that the continuous intravenous injection method used leads to "continuously high levels of the compound in the blood," and 2) that dimethyl sulfoxide (DMSO) was used to enhance tissue penetration (normal routes of exposure actually slow introduction of chemicals into the bloodstream). Finally, injecting rotenone into the body is not a realistic way of assimilating the compound. Similar studies (Marking 1988) have found no Parkinson-like results. Extensive research has demonstrated that rotenone does not cause birth defects (HRI 1982), gene mutations (Van Geothem et al. 1981; BRL 1982) or cancer (Marking 1988). Rotenone was found to have no direct role in fetal development of rats that were fed excruciatingly high concentrations of rotenone. Spencer and Sing (1982) reported that

rats were fed diets laced with 10-1000 ppm rotenone over a 10-day period did not suffer any reproductive dysfunction. Typical concentrations of actual rotenone used in fishery management range from 0.025 to 0.50 ppm and are far below that administered during most toxicology studies.

Similar results determined that birds required levels of rotenone at least 1,000 to 10,000-times greater than is required for lethality in fish (Skaar 2001). Cutkomp (1943) reported that chickens, pheasants, and other members of lower orders of *Galliformes* were quite resistant to rotenone, and four day old chicks were more resistant than adults. Ware (2002) reports that swine are uniquely sensitive to rotenone and it is slightly toxic to wildfowl, but to kill Japanese quail required 4,500 to 7,000 times more than is used to kill fish.

The EPA (2007) made the following conclusion for birds:

*Since rotenone is applied directly to water, there is little likelihood that terrestrial forage items for birds will contain rotenone residues from this use. While it is possible that some piscivorous birds may feed opportunistically on dead or dying fish located on the surface of treated waters, protocols for piscicidal use typically recommend that dead fish be collected and buried, rendering the fish less available for consumption (see Section IV). In addition, many of the dead fish will sink and not be available for consumption by birds. However, whole body residues of fish killed with rotenone ranged from 0.22 µg/g in yellow perch (*Perca flavescens*) to 1.08 µg/g in common carp (*Cyprinus carpio*) (Jarvinen and Ankley 1998). For a 68 g yellow perch and an 88 g carp, this represents totals of 15 µg and 95 µg of rotenone per fish, respectively. Based on the avian subacute dietary LC₅₀ of 4100 mg/kg, a 1000 g bird would have to consume 274,000 perch or 43,000 small carp. Thus, it is unlikely that piscivorous birds will consume enough fish to result in a lethal dose.*

Amphibians and Reptiles: Rotenone can be toxic to gill-breathing larval amphibians, though air breathing adults are less sensitive. Chandler and Marking (1982) found that clams and snails were between 50 and 150 times more tolerant than fish to Noxfish (5% rotenone formulation), and southern leopard frog tadpoles were between 3 and 10 times more tolerant than fish. Grisak et al. (2007) conducted laboratory studies on long toed salamanders, Rocky Mountain tailed frogs, and Columbia spotted frogs and concluded that the adults of these species would not suffer an acute response to Prenfish at trout killing concentrations (0.5-1 mg/L) but the larvae would likely be affected. These authors recommend implementing rotenone treatments at times when the larvae are not present, such as the fall, to reduce the chance of exposure to rotenone treated water and potential impacts to larval amphibians. Any reduction in

amphibian abundance would be expected to be short-term because of the low sensitivity of adults to rotenone and the treatment could be timed so as to minimize the risks to larval amphibians. A reduced abundance of aquatic invertebrates may temporarily impact larval and adult amphibians that prey on these species, however aquatic invertebrates would be expected to recover quickly. Reptiles would not be directly impacted by the rotenone treatment. Some snakes are known to consume fish; therefore, there could be temporary reduction in available food as a result of piscicide treatments, however, no reptiles present are known to be fish obligates.

Based on this information, FWP would expect the impacts to terrestrial organisms to range from non-existent to short-term and minor.

3.2 Fisheries Species and Water Resources

Numerous fish species are present in the proposed waterbodies and their drainages. In Yellow Water Reservoir, documented fish species include common carp, rainbow trout, walleye, white sucker, and yellow perch. Other species that may be present in the reservoir based on professional opinion include: longnose sucker, fathead minnow, longnose dace, and lake chub. In Big Casino Creek Reservoir, documented fish species include black crappie, brook trout, fathead minnow, lake chub, largemouth bass, longnose sucker, rainbow trout, white sucker, and yellow perch. Other species that may be present in the reservoir based on professional opinion include: longnose dace and rocky mountain sculpin. Rocky Mountain sculpin distribution is likely limited to the flowing portions of the Casino Creek drainage, but they may occasionally occur in the reservoir.

Northern redbelly dace and northern redbelly x finescale dace hybrids are Montana Species of Special Concern. Their presence has not been documented in the proposed waterbodies. However, they have been documented in the intermittent drainage upstream of Yellow Water Reservoir. They have not been documented in the Casino Creek drainage, but do exist in the neighboring spring-fed Little Casino Creek drainage.

Yellow Water Reservoir is a 490-acre irrigation storage reservoir located in Petroleum County approximately 12-miles southwest of Winnett, MT. The reservoir was constructed in 1938 and is owned by Montana DNRC. The reservoir impounds the Yellow Water Creek (intermittent) and Snoose Creek (ephemeral) drainages. The upstream drainages support a typical Montana prairie stream fish assemblage where habitat conditions are suitable, consisting of primarily native sucker and minnow species. The downstream drainage is intermittent and also supports a typical prairie stream fish assemblage until the confluence area with Petrolia Reservoir. Additional species downstream in the Petrolia confluence area include bluegill, northern pike, walleye, and yellow perch. The

total drainage area impounded is 33,364 acres (~52 square miles). The reservoir typically fills during spring runoff and is withdrawn throughout the summer months based on irrigation demand. Given the relatively arid climate and inconsistent flow regimes of the impounded drainages, water levels in the reservoir can fluctuate greatly both within and between years.

Big Casino Creek Reservoir is a 16-acre flood storage reservoir located in Fergus County on the outskirts of Lewistown. The reservoir was constructed in mid-1970's by the NRCS. The reservoir impounds the Casino Creek drainage (perennial). The drainage upstream of the reservoir supports brook trout, Rocky Mountain sculpin, white sucker, and additional minnow species, such as longnose dace and lake chub. The drainage downstream of the reservoir supports game fish such as brook trout, brown trout, mountain whitefish, and rainbow trout in addition to minnow and sucker species common to Big Spring Creek. The drainage area above the impoundment is approximately 12,800 acres (20 square miles). The reservoir is a flow-through reservoir and experiences little elevation fluctuation outside of the runoff period when it attenuates high flows. The dam is owned by the City of Lewistown, while Fergus County and Montana FWP have maintenance and access site responsibilities around the reservoir.

Alternative A: Proposed Action

The Proposed Action would result in minor impacts to the fisheries species present in the proposed waterbodies. The goal of stocking tiger muskie would be to reduce undesirable fish species via predation in an effort to improve the recreational fisheries. Predation of all fish species present would be expected. Negative impacts to white sucker and common carp populations would be a desired impact of the Proposed Action. Negative impacts to recreational fisheries could potentially be mitigated via stocking rates, fishing regulations, and population control efforts. The potentially impacted species are widespread and locally abundant.

The Proposed Action would introduce a new fish species into the proposed waterbodies for the purpose of providing biological control of nongame species. Additionally, the Proposed Action would provide a unique angling opportunity. Tiger muskie are sterile, meaning fisheries managers have a high level of management control over their population. Should escapement occur upstream or downstream, potential impacts to fish species would be considered minor given the lack of adequate habitat and relatively short-term impacts due to the sterility of the species. Movement of the introduced species in an upstream direction from the proposed reservoirs is limited by upstream movement barriers. At Yellow Water, upstream movement potential in Yellow Water Creek is less than ¼ mile, as stock dams prevent further upstream migration. In the

Snoose Creek drainage movement potential is at most 2.5 miles before a culvert barrier is reached. Snoose Creek is an ephemeral drainage and is inaccessible during much of the year. At Big Casino Creek Reservoir, upstream movement is limited to approximately ½ mile before a perched culvert is reached. Downstream movement is of little concern, as at both reservoirs, downstream habitat is not conducive to tiger muskie persisting. Downstream of Yellow Water Reservoir, Yellow Water Creek is intermittent and passes through at least 3 onstream impoundments before reaching Petrolia Reservoir. Downstream of Big Casino Creek Reservoir, the creek is perennial and flows into Big Spring Creek before entering the Judith River. Big Spring Creek does not provide adequate habitat for tiger muskie. Both proposed reservoirs have northern pike in waters downstream and should tiger muskie escape, new or cumulative impacts to existing fisheries are not anticipated.

The Proposed Action would not be anticipated to result in impacts to water resources.

Alternative B: No Action

The No Action Alternative would be expected to result in no impacts to fisheries species or water resources.

Alternative C: Mechanical Suppression

The Mechanical Suppression Alternative would result in minor impacts to the fish species present in the proposed waterbodies. Utilizing trap nets, the alternative would allow for directed removal of white sucker and common carp. Negative impacts to these species would be a stated goal of the alternative. The impacted species are widespread and abundant throughout Montana and reducing their numbers in the proposed waters would cause only localized impacts.

The Mechanical Suppression Alternative would not be expected to impact water resources.

Alternative D: Piscicide Treatment

As summarized in 2.4, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

The Piscicide Treatment Alternative would result in the complete removal of fish species in the proposed waterbodies, followed by the reestablishment of desired recreational fisheries via stocking and/or wild-fish transfers. Negative impacts to fish species would be a desired goal of this alternative. The potentially impacted species are widespread and abundant throughout Montana and reducing their numbers in the proposed waters

would cause only localized impacts, thus FWP would consider such impacts to be minor and could be mitigated.

Potential impacts to aquatic invertebrates are summarized below:

Numerous studies indicate that rotenone has temporary or minimal effects on aquatic invertebrates. The most noted impacts are temporary and often substantial reduction in invertebrate abundance and diversity. In a Montana study, aquatic invertebrates of nearly all taxa declined dramatically immediately post-rotenone treatment; however, only one year later nearly all taxa were fully recovered and at greater abundance than pre-treatment (Olsen and Frazer 2006). Chandler and Marking (1982) found that clams and snails were between 50-150 times more tolerant than fish to Noxfish (5% rotenone). Aquatic invertebrates' short life cycles, good dispersal ability, and high reproductive potential allow them to rapidly recover from disturbances (Anderson and Wallace 1984; Pennack 1989; Boulton et al. 1992). These findings in addition to the presence of quality aquatic invertebrate habitat nearby suggest that any impacts to aquatic invertebrates would be short-term and the aquatic invertebrate communities in each reservoir would recover quickly following the proposed treatment. Based on results of other rotenone projects in Montana, FWP would expect the aquatic invertebrate community to return to pre-treatment diversity and abundance within two years post-treatment. Thus, impacts would be considered short-term and minor.

The Department would plan a piscicide treatment such that impacts to water resources would be minor and short-term. The Piscicide Treatment Alternative would entail intentionally introducing a pesticide to surface water in order to remove unwanted fish. Piscicide treatment would use an EPA registered pesticide deemed safe for fish removal efforts. Treatment concentrations and detoxification would occur according to the product label and FWP policy. It is recommended that water treated with rotenone not be used to irrigate crops, released within ½ mile of potable water, or released near an irrigation water intake in a standing body of water. Thus, the Piscicide Treatment Alternative would have to occur outside of the irrigation season and/or at low-storage levels. If possible, no outflow would occur from the treated waterbody until post-treatment and detoxification, thus no impacts to downstream water users would be expected. If, by drastic unforeseen circumstances, the reservoir was to fill above the outlet structure/spillway while the rotenone treatment was occurring, the treatment would become diluted well below concentrations that would have impacts to the physical or human environments. While the treatment was ongoing, the areas around the reservoir would be thoroughly posted to caution against water use. The cautionary signage would remain until detoxification was complete. It is extremely unlikely that the Piscicide Treatment Alternative would result in discharge affecting any water quality standards, as the reservoir would be at low storage and no outflow would occur. FWP would apply rotenone under the Montana Department of Environmental Quality (DEQ)

General Permit for Pesticide Application (#MTG87000). A Notice of Intent (NOI) letter will be sent to DEQ to ensure proper compliance with DEQ regulations.

FWP would not anticipate impacts to ground water resources from the Pesticide Treatment Alternative. Rotenone readily binds to sediments and is broken down by soil and water (Skaar 2001; Engstrom-Heg 1971, 1976; Ware 2002). Rotenone moves about one inch in most soil types and up to three inches in sandy soils (Hisata 2002).

Numerous case studies in Montana have found that rotenone movement in groundwater does not occur. These studies include: a) monitoring of a down-gradient domestic well that shared the same aquifer of Tetrault Lake 2 & 4 weeks following a 90 ppb treatment, no rotenone or inert ingredients were detected, b) testing of a well 65 feet from a rotenone treated pond near Kalispell in which no rotenone was detected, c) testing of a well 4 times over a 21-day period following a rotenone treatment in a Kalispell area pond 200 feet away showed no sign of contamination, and d) monitoring of a well 30 yards from a treated pond near Thompson Falls found no rotenone or inert ingredients.

3.3 Aesthetics and Recreation

The proposed waterbodies are relatively popular recreation areas. Yellow Water Reservoir is surrounded by open space and native prairie grassland that provide aesthetic value. In addition to providing recreational fishing, Yellow Water and the surrounding area provide bird watching, upland bird hunting, waterfowl hunting, and big game hunting opportunities. Big Casino Creek Reservoir is on the outskirts of the city of Lewistown. It provides moderate aesthetic value. The reservoir provides recreational fishing, bird watching, and dog walking opportunities.

Alternative A: Proposed Action

The Proposed Action would not be expected to impact aesthetics.

Minor benefits to recreation would be expected from the Proposed Action. Stocking tiger muskie may increase recreational angling by improving the recreational fisheries and providing a unique species for anglers to target. Drastic increases in recreational use would not be expected and any impacts associated with increased recreational use (e.g. angler crowding, litter, user conflicts) would be minor.

Alternative B: No Action

The No Action Alternative would not impact aesthetics. Recreational opportunities would not be improved under this alternative.

Alternative C: Mechanical Suppression

The Mechanical Suppression Alternative would not be expected to impact aesthetics.

Mechanical Suppression would be expected to produce minor benefits to the recreational fisheries via suppression of undesirable fish species. Benefits to the recreational fisheries would be short-term in duration and dependent upon suppression success. Benefits are short-term, barring complete removal of the undesirable species, and would necessitate continual, annual suppression efforts to produce benefits. Mechanical suppression at Yellow Water Reservoir would not be expected to produce noticeable benefits to recreational anglers, given the scale of effort required and the size of the reservoir. The effectiveness of suppression efforts in Big Casino Creek Reservoir would be limited by the continual source of white suckers from the upstream drainage. For these reasons, impacts to recreation would be expected to be minor.

Alternative D: Piscicide Treatment

As summarized in 2.4, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

The Piscicide Treatment Alternative would be expected to produce short-term impacts to aesthetics via equipment on-site during the treatment and carcasses present following the treatment.

The Piscicide Treatment Alternative would be expected to produce minor impacts to recreation. Following a treatment, recreational opportunity at the reservoir would be impacted by the removal of fish species. Recreational opportunity would be restored upon detoxification and restocking the reservoir to reestablish the trout fishery. It would be expected that the recreational fishery would provide an improved opportunity for anglers once white suckers and common carp were removed.

3.4 Public Services, Taxes, and Community

Alternative A: Proposed Action

The Proposed Action would impact public services, in the form of FWP hatchery personnel and equipment. Any associated costs and impacts stemming from stocking tiger muskie would not be expected to cause any added burden to the state hatchery system. No impacts to taxes and community would be expected from the Proposed Action.

Alternative B: No Action

The Department would not anticipate impacts to public services, taxes, and community from the No Action Alternative.

Alternative C: Mechanical Suppression

The Mechanical Suppression Alternative would be expected to impact public services, in the form of FWP personnel and equipment. This alternative would require FWP personnel time, labor, travel, training, and equipment use to facilitate. Impacts would be minor. No impacts to taxes and community would be expected.

Alternative D: Piscicide Treatment

As summarized in 2.4, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

The Piscicide Treatment Alternative would be expected to impact public services, in the form of FWP personnel and equipment. This alternative would require FWP personnel time, labor, travel, training, and equipment use to facilitate. Impacts would be minor. No impacts to taxes and community would be expected.

3.5 Air Quality

Alternative A: Proposed Action

The Department anticipates there would be no changes to air quality stemming from the Proposed Action Alternative.

Alternative B: No Action

The Department anticipates there would be no changes to air quality stemming from the No Action Alternative.

Alternative C: Mechanical Suppression

The Department anticipates there would be no changes to air quality stemming from the Mechanical Suppression Alternative.

Alternative D: Piscicide Treatment

As summarized in 2.4, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

The Piscicide Treatment Alternative would be expected to produce minor impacts to air quality. Rotenone applications may create objectionable odors from aromatic petroleum solvents. These odors would dissipate rapidly and would likely only be noticeable to personnel performing the treatment. Additionally, a rotenone treatment would result in fish carcasses being present. FWP would attempt to remove fish carcasses from the site for disposal. Previous rotenone treatments have documented that fish decay rapidly and are difficult to find a few days after a treatment occurs. There may be objectionable odors created by decaying fish, however these impacts would be short-term in duration.

3.6 Risk and Health Hazards

Alternative A: Proposed Action

The Department anticipates there would be no changes to risks and health hazards stemming from the Proposed Action Alternative.

Alternative B: No Action

The Department anticipates there would be no changes to risks and health hazards stemming from the No Action Alternative.

Alternative C: Mechanical Suppression

The Department anticipates there would be no changes to risks and health hazards stemming from the Mechanical Suppression Alternative.

Alternative D: Piscicide Treatment

As summarized in 2.4, the Piscicide Treatment Alternative is not being considered at Big Casino Creek Reservoir.

The Piscicide Treatment Alternative would be expected to result in minor risks and health hazards. In order to minimize any potential impacts, all applicators would wear proper safety equipment as required by product labels and MSDS (Material Safety Data Sheets) such as respirator, goggles, rubber boots, overalls, and gloves. All applicators would be trained on the safe handling and application of rotenone. The project would be supervised and administered by a Montana Department of Agriculture certified pesticide applicator. All label specifications would be followed. All rotenone projects

conducted by FWP require a treatment plan. This plan addresses safety and emergency plans to be followed by all personnel. The plan establishes clear chains of command, training, delegation, assignment of responsibility, lines of communication, spill contingency plans, first aid, emergency responder information, personal protective equipment, monitoring and quality control, among others.

The EPA (2007) conducted an analysis of human health risks for rotenone and concluded it has a high acute toxicity for both oral and inhalation routes, but has a low acute toxicity for dermal route of exposure. It is not an eye or skin irritant nor a skin sensitizer. The EPA could not provide a quantitative assessment of potentially critical effects on neurotoxicity risks to rotenone users, so a number of uncertainty factors were assigned to the rating values. They are: an additional 10x database uncertainty factor – in addition to the inter-species (10x) uncertainty factor an intra-species (10x) uncertainty factor – has been applied to protect against human health effects and the target margin of exposure (MOE) is 1,000. The following table summarizes the EPA toxicological endpoints of rotenone (from EPA 2007):

Exposure Scenario	Dose Used in Risk Assessment, Uncertainty Factor (UF)	Level of Concern for Risk Assessment	Study and Toxicological Effects
Acute Dietary (females 13-49)	NOAEL = 15 mg/kg/day UF = 1000 $aRfD = \frac{15 \text{ mg/kg/day}}{1000} = 0.015 \text{ mg/kg/day}$	Acute PAD = 0.015 mg/kg/day	Developmental toxicity study in mouse (MRID 00141707, 00145049) LOAEL = 24 mg/kg/day based on increased resorptions
Acute Dietary (all populations)	An appropriate endpoint attributable to a single dose was not identified in the available studies, including the developmental toxicity studies		
Chronic Dietary (all populations)	NOAEL = 0.375 mg/kg/day UF = 1000 $cRfD = \frac{0.375 \text{ mg/kg/day}}{1000} = 0.0004 \text{ mg/kg/day}$	Chronic PAD = 0.0004 mg/kg/day	Chronic/oncogenicity study in rat (MRID 00156739, 41657101) LOAEL = 1.9 mg/kg/day based on decreased body weight and food consumption in both males and females
Incidental Oral Short-term (1-30 days) Intermediate-term (1-6 months)	NOAEL = 0.5 mg/kg/day	Residential MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2.4/3.0 mg/kg/day [M/F] based on decreased parental (male and female) body weight and body weight gain
Dermal Short-, Intermediate-, and Long-Term	NOAEL = 0.5 mg/kg/day 10% dermal absorption factor	Residential MOE = 1000 Worker MOE = 1000	Reproductive toxicity study in rat (MRID 00141408) LOAEL = 2.4/3.0 mg/kg/day

Inhalation Short-term (1-30 days) Intermediate- term (1-6 months)	NOAEL = 0.5 mg/kg/day 100% inhalation absorption factor	Residential MOE = 1000 Worker MOE = 1000	[M/F] based on decreased parental (male and female) body weight and body weight gain
Cancer (oral, dermal, inhalation)	Classification: No evidence of carcinogenicity		

UF = uncertainty factor, NOAEL = no observed adverse effect level, LOAEL = lowest observed adverse effect level, aPAD = acute population adjusted dose, cPAD = chronic population adjusted dose, RfD = reference dose, MOE = margin of exposure, NA = Not Applicable

Rotenoloids are common degradation products found in the parent plant material used to make piscicidal forms of rotenone. The EPA (2007) concluded these degradation products are no more toxic than the active ingredient.

The EPA analysis of acute dietary risk for both food and drinking water concluded:

When rotenone is used in fish management application, food exposure may occur when individuals catch and eat fish that either survived the treatment or were added to the water body (restocked) prior to the complete degradation. Although exposure from this route is unlikely for the general U.S. population, some people might consume fish following a rotenone application. EPA used maximum residue values from a bioaccumulation study to estimate acute risk from consuming fish from treated water bodies. This estimate is considered conservative because the bioaccumulation study measured total residues in edible portions of fish including certain non-edible portions (skin, scales, and fins) where concentrations may be higher than edible portions (tissue) and the Agency assumed that 100% of fish consumption could come from rotenone exposed fish. In addition, fish are able to detect rotenone's presence in water and, when possible, attempt to avoid the chemical by moving from the treatment area. Thus, for partial kill uses, surviving fish are likely those that have intentionally minimized exposure.

Acute exposure estimates for drinking water considered surface water only because rotenone is only applied directly to surface water and is not expected to reach groundwater. The estimates drinking water concentration (EDWC) used in dietary exposure estimates was 200 ppb, the solubility limit of rotenone. The drinking water risk assessment is conservative because it assumes water is consumed immediately after treatment with no degradation and no water treatment prior to consumption. Acute dietary exposure estimates result in dietary risk below the Agency's level of concern. Generally, EPA is concerned when risk estimates exceed 100% of the acute population adjusted dose (aPAD). The exposure for the "females 13-49 years old" subgroup (0.1117 mg/kg/day) utilized 74% of the aPAD (0.015 mg/kg/day) at

the 95th percentile (see Table). It is appropriate to consider the 95th percentile because the analysis is deterministic and unrefined. Measures implemented as a result of this RED will further minimize potential dietary exposure (see Section IV)...

As for evaluating the human chronic risk from exposure to rotenone treated water, the EPA acknowledges the four principle reasons for concluding there is a low risk. First, the rapid natural degradation of rotenone. Second, using active detoxification measures by applicators such as potassium permanganate. Next, properly following piscicide labels which prohibit the use near water intakes. Finally, proper signing, public notification or area closures which limit public exposure to rotenone treated water.

As for recreational exposure, the EPA concludes no risk to adults who enter treated water following the application from dermal or incidental ingestion, but requires a waiting period of 3 days after a treatment before toddlers swim in treated water. The aggregate risk to human health from food, water, and swimming does not exceed the EPA level of concern (EPA 2007). Recreationists in the area would likely not be exposed to the treatments because a temporary closure would preclude many from being in the area. Proper warning through news releases, signing the project area, road closure, and administrative personnel in the project area should be adequate to keep unintended recreationists from being exposed to any treated waters.

Fisher (2007) conducted an analysis of the inert constituent ingredients found in the rotenone formulation of CFT Legumine for the California Department of Fish and Game. These inert ingredients are principally found in the emulsifying agent Fennodefo⁹⁹ which helps make the generally insoluble rotenone more soluble in water. The constituents were considered because of their known hazard status and not because of their concentrations in the CFT Legumine formulation. Solvents such as xylene, trichloroethylene (TCE) and tetrachloroethylene are residue left over from the process of extracting rotenone from the root and can be found in some lots of CFT Legumine. However, inconsistent detectability and low occurrence in other formulations that used the same extraction process were below the levels for human health and ecological risk. Solvents such as toluene, *n*-butylbenzene, 1,2,4 trimethylbenzene and naphthalene are present in CFT Legumine, and when used in other applications can be an inhalation risk. However, because of their low concentrations in this formulation, the human health risk is low. The remaining constituents, the fatty acid esters, resin acids, glycols, substituted benzenes, and *l*-hexanol were likewise present but either, analyzed, calculated or estimated to be below the human health risk levels when used in a typical fish eradication project.

Methyl pyrrolidone is also found in CFT Legumine. It is known to have good solvency properties and is used to dissolve a wide range of compounds including resins (rotenone). Analysis of methyl pyrrolidone in CFT Legumine showed it represents about

9% of the formulation (Fisher 2007). The analysis by Fisher (2007) concluded the following regarding the constituent ingredients in CFT Legumine:

...None of the constituents identified are considered persistent in the environment nor will they bioaccumulate. The trace benzenes identified in the solvent mixture of CFT Legumine™ will exhibit limited volatility and will rapidly degrade through photolytic and biological degradation mechanisms. The PEGs are highly soluble, have very low volatility, and are rapidly biodegraded within a matter of days. The fatty acids in the fatty acid mixture (Fennodefo⁹⁹™) do not exhibit significant volatility, are virtually insoluble, and are readily biodegraded, although likely over a slightly longer period of time than the PEGs in the mixture. None of the new compounds identified exhibit persistence or are known to bioaccumulate. Under conditions that would favor groundwater exchange the highly soluble PEGs could feasibly transmit to groundwater, but the concentrations in the reservoir, and the rapid biodegradation of these constituents makes this scenario extremely unlikely. Based upon a review of the physical chemistry of the chemicals identified, we conclude that they are rapidly biodegraded, hydrolyzed and/or otherwise photolytically oxidized and that the chemicals pose no additional risk to human health or ecological receptors from those identified in the earlier analysis. None of the constituents identified appear to be at concentrations that suggest human health risks through water, or ingestion exposure scenarios and no relevant regulatory criteria are exceeded in estimated exposure concentrations...

The CFT Legumine MSDS states "...when working with an undiluted product in a confined space, use a non-powered air purifying respirator...and...air-purifying respirators do not protect workers in oxygen-deficient atmospheres..." It is not likely that workers would be handling CFT Legumine in an oxygen deficient space during normal use. However, to guard against this, proper ventilation and safety equipment would be used according to the label requirements.

In their description of how South American Indians prepare and apply *Timbó*, a rotenone parent plant, Teixeira et al. (1984) reported that the Indians extensively handled the plants during a mastication process, and then swam in lagoons to distribute the plant pulp. No harmful effects were reported. It is important to note that the primitive method of applying rotenone from the root does not involve a calculated target concentration, metering devices, or involve human health risk precautions as those involved with fisheries management programs.

One study, in which rats were injected with rotenone for a period of weeks, reported finding lesions characteristic of Parkinson's disease (Betarbet et al. 2000). However, the results have been challenged on the basis of methodology: 1) that the continuous

intravenous injection method used leads to “continuously high levels of the compound in the blood,” and 2) that dimethyl sulfoxide (DMSO) was used to enhance tissue penetration (normal routes of exposure actually slow introduction of chemicals into the bloodstream). Finally, injecting rotenone into the body is not a realistic way of assimilating the compound. Similar studies (Marking 1988) have found no Parkinson-like results. Extensive research has demonstrated that rotenone does not cause birth defects (HRI 1982), gene mutations (Van Geothem et al. 1981; BRL 1982) or cancer (Marking 1988). Rotenone was found to have no direct role in fetal development of rats that were fed excruciatingly high concentrations of rotenone. Spencer and Sing (1982) reported that rats were fed diets laced with 10-1000 ppm rotenone over a 10-day period did not suffer any reproductive dysfunction. Typical concentrations of actual rotenone used in fishery management range from 0.025 to 0.50 ppm and are far below that administered during most toxicology studies.

A recent study linked the use of rotenone and paraquat with the development of Parkinson’s disease (PD) in humans later in life (Tanner et al. 2011). The after the fact study included mostly farmers from 2 states within the United States who presumably used rotenone for terrestrial application to crops and/or livestock. Rotenone is no longer approved for agricultural uses and is only approved for aquatic application as a piscicide. The results of the epidemiological studies of pesticide exposure, such as this one have been highly variable (Guenther et al. 2011). Studies have found no correlations between pesticide exposure and PD (e.g., Jimenez-Jimenez 1992; Hertzman 1994; Engel et al. 2001; Firestone et al. 2010), some have found correlations between pesticide exposure and PD (e.g., Hubble et al. 1993; Lai et al. 2002; Tanner et al. 2011) and some have found it difficult to determine which pesticide or pesticide class is implicated if associations with PD occur (e.g., Engel et al. 2001; Tanner et al. 2009). Recently, epidemiological studies linking pesticide exposure to PD have been criticized due to the high variation among study results, generic categorization of pesticide exposure scenarios, questionnaire subjectivity, and the difficulty in evaluating the causal factors in the complex disease of PD, which may have multiple causal factors (age, genetics, environment) (Raffaele et al. 2011). A specific concern is the inability to assess the degree of exposure to certain chemicals, including rotenone, particularly the concentration of the chemical, frequency of use, application, (e.g., agricultural, insect removal from pets), and exposure routes (Raffaele et al. 2011). No information is given in the Tanner et al. (2011) study about the formulation of rotenone used (powder or liquid) or the frequency or dose farmers were exposed to during their careers. There is also no information given about the personal protective equipment used or any information about other pesticides farmers were exposed to during the period of study. It is also unclear in the Tanner et al. (2011) study the frequency and the dose individuals were exposed to during the time period of use. Without information on how much rotenone individuals were exposed to and for how long, it is difficult to evaluate the

potential risk to humans of developing Parkinson's disease from aquatic applications of rotenone products.

The state of Arizona conducted an exhaustive review to the risks to human health of rotenone use as a piscicide (Guenther et al. 2011). They concluded: "To date, there are no published studies that conclusively link exposure to rotenone and the development of clinically diagnosed PD. Some correlation studies have found a higher incidence of PD with exposure to pesticides among other factors, and some have not. It is very important to note that in case-control correlation studies, causal relationships cannot be assumed and some associations identified in odds-ratio analyses may be chance associations. Only one study (Tanner et al. 2011) found an association between rotenone and paraquat use and PD in agricultural workers, primarily farmers. However, there are substantial differences between the methods of application, formulation, and doses of rotenone used in agriculture and residential settings compared with aquatic use as a piscicide, and the agricultural workers interviews were also exposed to many other pesticides during their careers. Through the EPA re-registration process of rotenone, occupations exposure risk is minimized by: new requirements that state handlers may only apply rotenone at less than the maximum treatment concentrations (200ppb), the development of engineering controls to some of the rotenone dispensing equipment, and requiring handlers to wear specific PPE."

It is clear that to reduce or eliminate the risk to human health, including any potential risk of developing Parkinson's disease, public exposure to rotenone treated water must be eliminated to the extent possible. To reduce the potential for exposure of the public during the proposed treatment project, areas treated with rotenone would be closed to public access during the treatment. Signs would be placed at access points informing the public of the closure and the presence of rotenone treated waters. Personnel would be onsite to inform the public of the closure and the escort them from the treatment area should they enter. Rotenone treated waters would be contained to the proposed treatment areas by preventing outflow from the reservoirs. The efficacy of neutralization would be monitored using fish (the most sensitive species to the chemical) and a handheld chlorine meter. Therefore, the potential for public exposure to rotenone treated waters is very minimal. The potential for exposure would be greatest for those workers applying the chemical. To reduce their exposure, all CFT Legumine label mandates for personal protective equipment would be adhered to.

Chapter 4.0: Resources Considered but Eliminated from Detailed Analysis

The Montana Environmental Policy Act, MCA § 75-1-101 et seq. (MEPA), provides for the identification and elimination from detailed study of issues which are not significant or

which have been covered by a prior environmental review, narrowing the discussion of these issues to a brief presentation of why they would not have a significant effect on the physical or human environment or providing a reference to their coverage elsewhere (ARM 12.2.434(d)). While these resources are important, they were either unaffected by the alternatives considered and/or mildly affected and the effects could be mitigated.

4.1 Land Use

FWP anticipates no changes in land use from the Proposed, No Action, or other listed alternatives.

4.2 Habitat and Vegetation

The Department does not anticipate changes in habitat or vegetation stemming from any of the listed alternatives.

4.3 Noise and Utilities

The Department anticipates there would be no changes to noise levels or utilities for any of the listed alternatives.

4.4 Cultural and Historic Resources

The Department does not anticipate changes in cultural or historic resources associated with any of the listed alternatives.

4.4 Cumulative Effects

The Department does not anticipate cumulative effects from any of the listed alternatives.

Chapter 5.0: Identification, Rationale, and Recommendation for Preferred Project Alternative

5.1 Introduction

Yellow Water Reservoir is a 490-acre irrigation storage reservoir located in Petroleum

County approximately 12-miles southwest of Winnett, MT. The reservoir was constructed in 1938 and is owned by Montana DNRC. The reservoir impounds the Yellow Water Creek (intermittent) and Snoose Creek (ephemeral) drainages. The total drainage area impounded is 33,364 acres (~52 square miles). The reservoir typically fills during spring runoff and is withdrawn throughout the summer months based on irrigation demand. Given the relatively arid climate and inconsistent flow regimes of the impounded drainages, water levels in the reservoir can fluctuate greatly both within and between years. The southwest portion of the reservoir is part of the US Fish & Wildlife Service's War Horse National Wildlife Refuge (NWR). The War Horse NWR was established as a refuge and breeding ground for migratory birds and other wildlife. In addition to its use as an irrigation reservoir and fishery, Yellow Water Reservoir is also used for waterfowl hunting.

Yellow Water Reservoir has been managed as a put-grow-and-take rainbow trout fishery for nearly 60 years, the only such reservoir of its size in Petroleum County. The reservoir undergoes a boom-bust cycle based on water conditions and reservoir productivity. When in the boom phase, the reservoir provides a productive rainbow trout fishery that produces some trophy fish greater than 5-pounds. The bust phase has historically occurred during low-water periods, when chronic winterkill conditions can occur. In more recent years, the reservoir has entered a bust cycle following the high flows of 2011, 2013, 2014, & 2018, which have led to an influx of white suckers and common carp. These non-game species have drastically reduced the rainbow trout productivity and led to reduced stocking rates of the reservoir. The rainbow trout bust and a lack of management action to date seem to have encouraged disgruntled anglers to illegally stock yellow perch and walleye. While these illegal introductions have not led to drastic impacts to the fishery and are unlikely to do so in the future, it does highlight the need for management action to attempt to address the current bust cycle in Yellow Water. Past bust cycles have ended without direct management action, primarily via drought leading to complete fish kills eliminating non-game species and wet periods refilling the reservoir and providing the productive stocked rainbow fisheries once again.

Big Casino Creek Reservoir is a 16-acre flood storage reservoir located in Fergus County on the outskirts of Lewistown. The reservoir was constructed in mid-1970's by the NRCS. The reservoir impounds the Casino Creek drainage (perennial). The drainage area above the impoundment is approximately 12,800 acres (20 square miles). The reservoir is a flow-through reservoir and experiences little elevation fluctuation outside of the runoff period when it attenuates high flows. The dam is owned by the City of Lewistown, while Fergus County and Montana FWP have maintenance and access site responsibilities around the reservoir. The reservoir and surrounding area are primarily used for angling and dog walking.

Fisheries management in Big Casino Creek Reservoir has been varied over the years.

Rainbow trout have been the primary species stocked historically, however their productivity was limited. Walleye were stocked from 1997 to 2006 and performed well, however, escapement rates and potential impacts to downstream fisheries were a concern. Yellow perch were illegally introduced in the late-90's and continue to persist. Northern pike were also illegally introduced in the late-90's, however they did not establish in the reservoir. The reservoir is currently being managed for largemouth bass and crappie. The transition to the bass-crappie fishery was initiated in 2015 stemming from angler interest in diverse recreational opportunities in the Lewistown area. The species have been slow to establish and have not provided a quality fishery to date. Other species currently present in Big Casino include: brook trout, lake chub (native), yellow perch, and white sucker (native).

5.2 Identification and rationale for preferred alternative

Yellow Water and Big Casino Creek Reservoirs are currently providing poor recreational fishing opportunities. As such, it is important to consider management actions in an effort to provide the highest quality angling experience possible at these waters. FWP believes the most significant limitation to the quality of these fisheries is competition for resources with nongame species. Although they are native fish and important to the ecosystem, white suckers, and non-native common carp, can overpopulate some waters and suppress the productivity of a fishery, especially in artificial impoundments.

As mentioned in the above section, Yellow Water Reservoir has a documented history of boom-bust cycles. Currently, the influx of white suckers and common carp have drastically reduced the productivity and quality of the rainbow trout fishery. In the past, no management efforts were taken during these bust cycles and they were ended naturally via environmental factors that cleared the slate for the trout fishery to boom once again. The area is currently in a wet period and since 2011, the reservoir has experienced 150-300% of average storage for most of the period to date, excluding the summer/fall of 2017. Yellow Water is unlikely to experience the drought required to eliminate the non-game species in the immediate future given the current storage of the reservoir. FWP has refrained from taking management action to suppress the nongame species to date on the basis that environmental factors would induce the necessary conditions to restart the fishery. As these conditions have not yet occurred and the fishery quality has been in decline since 2011, management action is needed to suppress/remove the nongame species in order to provide a better recreational fishery.

Beginning in 2015, FWP has attempted to transition Big Casino Creek Reservoir from a stocked rainbow trout, wild yellow perch fishery to a largemouth bass and crappie fishery. Stocking of rainbow trout ended in 2014. From the period of 2015 to 2018, 18,000 2-inch largemouth bass have been stocked. In 2015, 100 black crappie were transferred from the

Great Falls area to Big Casino. FWP anticipates the establishment of the bass-crappie fishery to take 3-5 years, if it is to be successful. The temperature regime and retention time in Big Casino Creek Reservoir may limit the productivity of the bass-crappie fishery and prevent it from establishing. An additional factor which is limiting the productivity and quality of a recreational fishery at Big Casino Creek is the extreme abundance of white suckers. Recent gill net and fyke net sampling has found white sucker CPUE ranging from 71-767 fish per net. Suppression of the white sucker population is necessary if the reservoir is to provide a recreational fishery. Time will tell if the environmental conditions in Big Casino Creek Reservoir are conducive to a productive bass-crappie fishery.

FWP has identified three primary management actions that might be used to suppress the undesirable species in the waters of interest. One method could involve mechanical suppression, where high-intensity, long duration trap netting would occur. An additional method could involve chemical removal, where a piscicide is used to euthanize all fish in the reservoir. The preferred method would be to use biological suppression. Biological suppression provides a less costly, low-intensity alternative by stocking a biological control mechanism such as a predatory fish to suppress and prey upon the undesirable fish populations. This alternative has the potential to meet the management goals of suppressing nongame numbers and providing competitive release for the recreational fisheries.

Based on the management needs, FWP proposes to use tiger muskie as a biological control of nongame species in Yellow Water and Big Casino Creek Reservoirs.

Tiger muskie are a hybrid of northern pike and muskellunge. Because the hybrids are sterile, fisheries managers can tightly control tiger muskie numbers which eliminates the risk of developing a long-term population. Tiger muskie experience rapid growth, attaining 12 inches at 1 year, 35 inches at 6 years, and over 40 inches at 10 years and beyond (Lorantus & Kristine 2005). Growth rates in nearby Ackley Lake have been remarkable, with fish reaching 17 inches at 1 year and reports of fish of 40 inches at 4 years. The current Montana state record tiger muskie weighed 38 pounds and was 50 inches long. Tiger muskie are an opportunistic top-level predator with a diet of almost entirely fish, if available. In a laboratory setting, tiger muskie have been found to prefer white suckers over yellow perch and golden shiners (Engstrom-Heg et al. 1986). The authors go on to theorize that due to the bottom-oriented nature of tiger muskie, they tend to select bottom-oriented prey over those that school in mid-water and prefer soft-rayed fishes over spiny-rayed fishes. Tiger muskie are thought to perform best in shallow, vegetated lakes. They have been found to prefer littoral areas of shallow water macrophytes when available where they can ambush prey. During winter months, tiger muskie become increasingly mobile to find suitable habitat conditions and search out prey in pelagic water (Tipping 2001).

Tiger muskie are being increasingly used as a biological control management tool to

manage undesirable game and nongame fish in efforts to improve recreational fisheries. For example, efforts by the New Mexico Department of Game and Fish have utilized tiger muskie to depress sucker and goldfish populations in order to benefit trout fisheries (Moffatt 2010). The Idaho Fish and Game found tiger muskies to be very effective at depressing brook trout populations in mountain lakes to the benefit of native species conservation (DuPont et al. 2011). Recent studies have documented that tiger muskie are not a silver bullet and can negatively impact stocked trout fisheries as well (Lepak et al. 2014; NMDGF 2014). The studies strongly recommend that fisheries managers identify management goals and carefully consider tiger muskie stocking rates. There are examples of successfully using tiger muskie here in Montana, as seen by the improvement of recreational trout fisheries in Deadmans Basin Reservoir and Lebo Lake and the suppression of white suckers in Ackley Lake. Additionally, stocking tiger muskie has provided unique, trophy fisheries at these waterbodies.

The purpose of having the management option of stocking tiger muskie in the waterbodies described would be 1) to provide a biological control of the white sucker and common carp populations, 2) to improve growth and survival of the target recreational fisheries, 3) to increase angler use and improve angler satisfaction, and 4) to provide a unique, trophy opportunity for tiger muskie.

Montana Fish, Wildlife, & Parks has attempted similar introductions to other waterbodies as proposed in this document in efforts to decrease sucker densities and improve recreational angling. These projects have been generally successful at meeting the management objectives.

5.3 Mitigation and monitoring commitments

Should unintended consequences of the proposed action occur and require mitigation, 3 alternatives or any combination thereof could occur. Liberalizing harvest regulations and/or culling tiger muskie could mitigate unintended consequences. Additionally, altering the stocking program via species or numbers stocked could mitigate unintended impacts to the recreational fisheries.

The fisheries objectives would be monitored via continued fish population monitoring on any impacted waterbodies. The fisheries objectives have the potential to suppress undesirable species, improve the quality of two recreational fisheries, and create unique, trophy opportunities. Fish population monitoring would entail standard sampling methods such as gillnets, fyke nets, electrofishing, and seining. Angler satisfaction would be monitoring via creel surveys and angler interviews.

At Yellow Water Reservoir, we would measure the success of stocking tiger muskie by the following metrics: 1) observing a decline in the catch per unit effort (CPUE) of white

suckers and common carp; and 2) increased CPUE of rainbow trout. Rainbow trout stocking in Yellow Water has been drastically reduced due to the significant declines in productivity following establishment of white suckers and common carp. If introduced, we would anticipate declines in non-game species abundance that would justify increasing the stocking rates of rainbow trout.

1. Since their establishment in 2011, CPUE of non-game species has been highly variable. White sucker CPUE has ranged from 5 to 32.5 (SD=11.9) and common carp CPUE has ranged from 1.5 to 123.5 (SD=43.2). Given the variability, it is difficult to identify an achievable target CPUE. However, after excluding the first year of establishment in 2011, the median CPUE of suckers and carp combined is 30 and has been relatively stable. Any CPUE declines among the undesirable species are likely to benefit the recreational fishery and the angling public. For the sake of identifying a target objective, the goal of the tiger muskie introduction would be to reduce the combined sucker/carp CPUE to 15 fish per net.

2. Rainbow trout have not been sampled in Yellow Water since the fall of 2014 and, as mentioned above, have been stocked at very low levels due to the current status of the fishery and lack of trout productivity. No specific CPUE target is necessary for a rainbow trout metric. If stocked tiger muskie reduce non-game CPUE, then FWP would consider increasing the stocking rates of rainbow trout, which would lead to increased CPUE.

At Big Casino Creek Reservoir, we would measure the success of stocking tiger muskie by the following metrics: 1) observing a decline in the catch per unit effort (CPUE) of white suckers. 2) Given that the target fishery of largemouth bass and crappie is still establishing in the reservoir, it is not feasible to identify measurable benefits. Additionally, it would be anticipated that improving the quality of the angling experience at Big Casino would result in more angler use and higher satisfaction. Unfortunately, adequate data does not exist on these metrics to define measurable goals. However, the metrics could be monitored post-introduction via creel surveys.

1. White sucker CPUE in Big Casino Creek has increased drastically since the 2000's. The CPUE in 2018 was 17.8 fish per net-hour. Previous sampling in the 2000's averaged 1.9 fish per net-hour. The target objective of stocking tiger muskie would be to reduce white sucker CPUE by half, to 9 fish per net-hour. Ideally, the tiger muskie introduction would reduce white sucker CPUE to levels seen during the 2000's.

For the reasoning given above, it is not feasible to define a measurable objective for the largemouth bass and crappie populations. Establishment of either/both population would be considered a success. However, it is important to note that the lack of establishment would not be considered evidence of failure of the proposed action.

Chapter 6.0: Public Participation and Collaborators

6.1 Public Participation

FWP has initiated conversations with local anglers in an attempt to gauge public interest and support for the proposed action. To date those conversations have been generally supportive of the proposed action.

This EA will be circulated to interested parties such as angling groups and local sporting goods stores. It will be posted on the FWP website and copies will be made available in the FWP Lewistown Area Resource Office, Region 4 headquarters, and Region 5 headquarters for a period of 30 days. A notice of the proposed project and EA will be advertised via an FWP press release.

6.2 Public Comment Period

The EA will be open for public comment beginning on April 18, 2019 through May 17, 2019. Comments can be sent to:

Montana Fish, Wildlife & Parks
Attn: Tiger Muskie Stocking EA
333 Airport Road, Ste. 1
Lewistown, MT 59457
or

clsmith@mt.gov (using Tiger Muskie Stocking EA in the subject line)

6.3 Approximate Timeline of Events

EA Drafting: February/March 2019

Public Comment Period: April 17, 2019 to May 17, 2019

Decision Notice Published: May 31, 2019

Project Implementation: Summer 2019*

*contingent on Decision Notice and tiger muskie availability from the FWP hatchery system

Chapter 7.0: Determination if an Environmental Impact Statement is Required

Based on the significance criteria evaluated in this EA, is an Environmental Impact

Statement (EIS) required?

No. This EA revealed no significant negative impacts stemming from the Proposed Action. The significance criteria described in ARM 12.2.431 were used in this determination. Based upon the above assessment, an EIS is not required and an EA is the appropriate level of review.

Chapter 8.0: EA Preparation

This EA was prepared by:

Clint Smith, FWP Fisheries Biologist
333 Airport Road, Ste. 1
Lewistown, MT 59457

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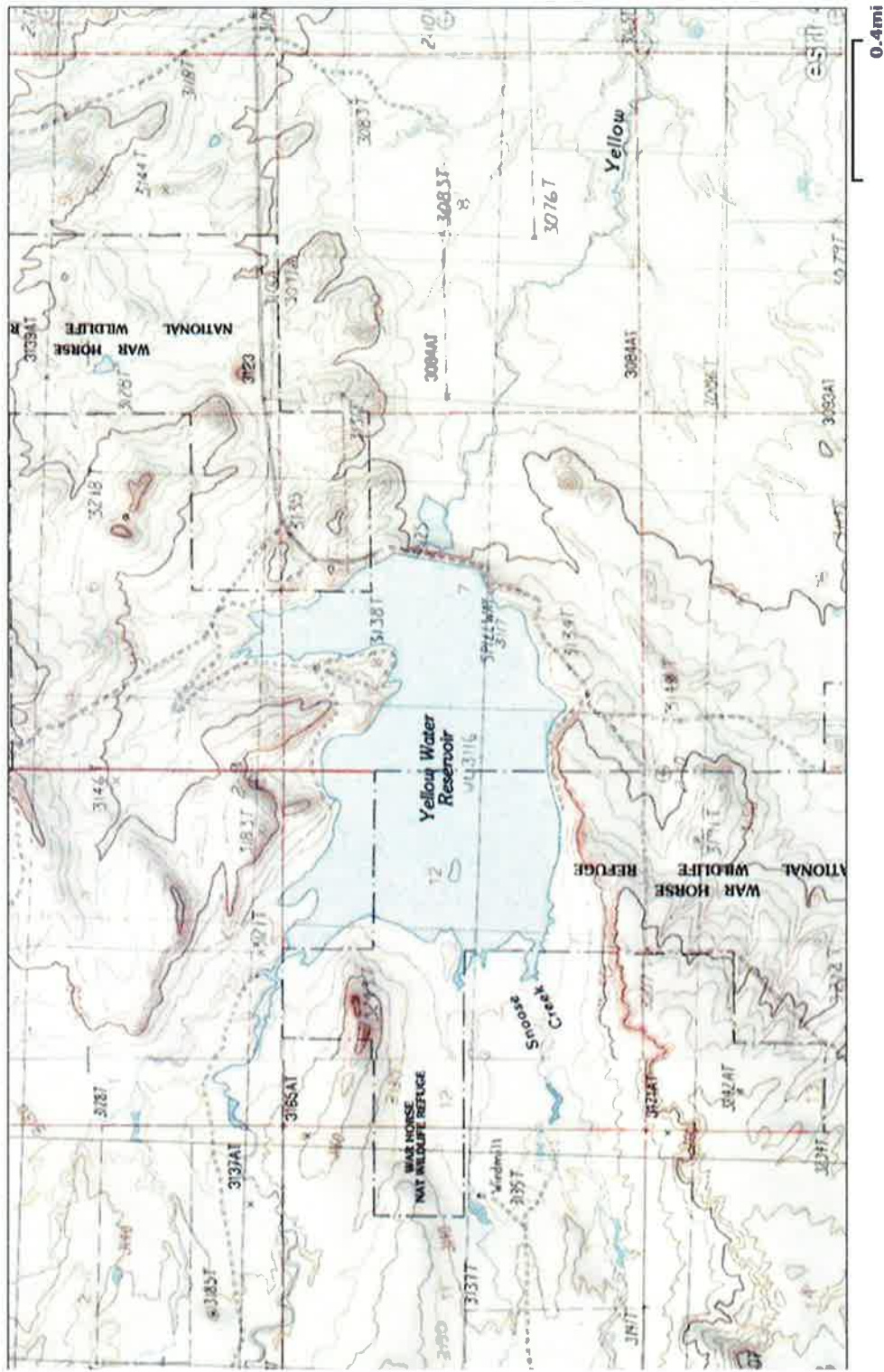
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Appendix A

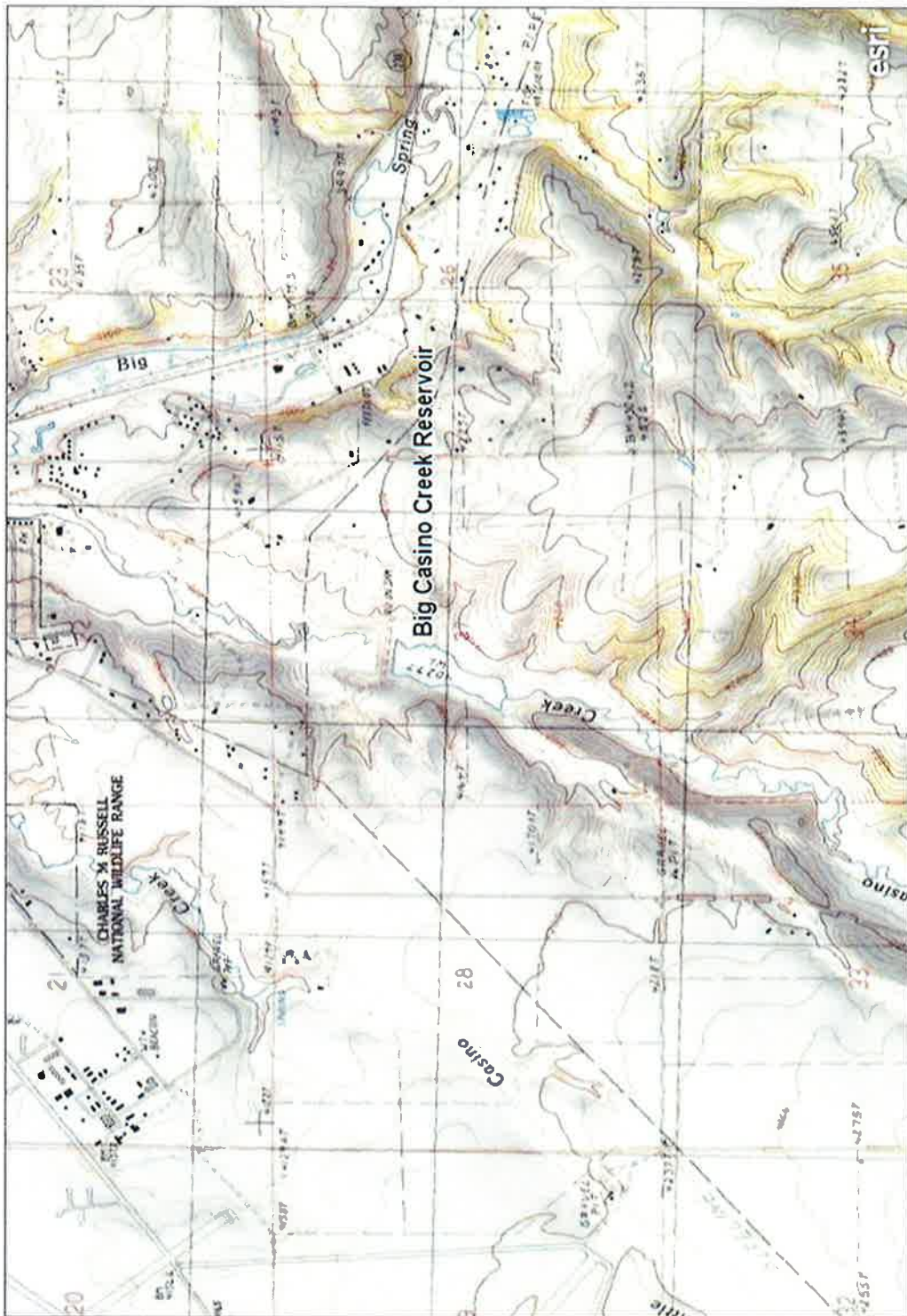
Topographic Maps of Yellow Water and Big Casino Creek Reservoirs.



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Appendix A Continued:

Topographic Maps of Yellow Water and Big Casino Creek Reservoirs.



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